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Types and Levels of Ubiquitous Technology Use among ICT Undergraduates

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Abstract

Due to the chrysalis of the advanced ubiquitous technology and their capabilities in assisting students to engage and occupy with the ubiquitous learning, most undergraduates have owned an *au courant* technology and using them ubiquitously either for learning or leisure purposes. Hence, this study is to identify the types and levels of ubiquitous technology use among undergraduates from one of four Malaysian Technical Universities. This will actually represent *how* undergraduates at higher learning in Malaysia use ubiquitous technology and the level of use of ubiquitous technology. This will assist the university's administration in preparing a path towards implementing a ubiquitous learning environment at the university. The data of this study is gathered through a 5 point-Likert scale questionaire, with the reliability of 0.819 for levels of use and 0.901 for types of use. The sample is undergraduates studying at Information, Communication & Technology Faculty and statistical analyses of data collected are performed by SPSS 17. Results show that majority of the students is at routine level of ubiquitous technology use (mean = 2.74, SD = 0.484), meanwhile, the central type of ubiquitous technology use is for inquiry and general use, followed by communication use, expression use and construction use.

Keywords: Ubiquitous Technoloy; Types; Level of Use; ICT Students;

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1. Research Background

In this techno-centric world, there just doesn't seem to be one perfect technology for young people including students either for learning or leisure purposes. Some want to carry only one device around, in which case a multi-functional mobile phone is the best bet. Others want to watch movies on a larger screen, which means a different type of technology is called for. There are a number of different technologies are being used by students which including web-enables wireless phones (e.g., smart phones), web-enabled wireless handheld computers (e.g., tablet), wireless laptop computers and Personal Digital Assistants (PDAs). However, the most often technologies used in learning environments are wireless laptop computers, smartphones and tablet (Shin, et al., 2011; Robert, 2011; Russ, 2011; Yalk, 2010 & Wai, 2008)

The types of use of ubiquitous technology either for learning or leisure purposes will open to a thousand possibilities for the students, in creating an open environment and connecting classes around the world and providing more individualized instruction for students (Lei, 2010). Nevertheless, to integrate technology into educational system is not a small task. Starting with the infrastructure, and then working its way through the possibilities and challenges and finally to understand the acceptance and its impact on learners (Weiser, 1993).

Furthermore, technology can help facilitate the knowledge-constructed classroom. A number of researchers (e.g. Young, 2011; Lei, 2010; Zoraini et al, 2009) view technology such as a smartphone and laptop as influential technology that may affect teaching and learning outcomes. They stated that with the use of these technologies, learning environment would focus more on student-centered and individualized learning. In the student-centered learning environment, with the aid of the relevant technology as aforementioned, students are able to collaborate, use critical thinking, develop certain generic skills like lifelong learning skills and find alternatives to solutions of problems (Dewey, 1943).

Researches done by Levin (1997) and Zoraini (2009) indicated that technology like laptop can be used in collaboration for all subjects' areas, such as in engineering, technical, ICT, even in social science field. However, educators have to take into account the different styles of teaching, the involvement of students in learning and importantly the suitable technology to be used as a central mediator during instruction. This type of teaching requires a change in educators' method of teaching and learning, the amount of time needed to learn how to use the technology and the location of models that work with technology. Meanwhile, (Resnick, 2009) posit:

"…that digital technologies an enable students to become more active and independent learners. The Internet will allow new "knowledge-building communities" in which students and adults from around the globe cab collaborate and learn from each other. Computers will allow students to take charge of their own learning through direct exploration, expression and experience. This shifts the student's role from "being taught" to "learning" and the educators' role from "expert" to "collaborators" or "guide" (p. 1).

As the development of technology fast-pace, the number of technology sold at the market was sky-rocket as they offered a reasonable price, so the buying power among undergraduates will also increase, therefore the importance of ubiquitous technology in educational system and integration was magnified. There were many opportunities in using ubiquitous technologies in the classroom; from connecting classes around the world to provide more individualized instruction for students, engage and occupy students with the system and active learning environment while in or outside classroom

environment. These tools had become a learning tool for undergraduates constantly on the move and being 'on' and networked all time. Although more than half of the undergraduates have not familiar with ubiquitous learning, yet they had an excellent perception of the benefit of the related technologies and without their knowing the technologies support that type of learning are already within their vicinity, very close to them.

1.1. Levels of Technology Use

The Level of the Use of the Innovation (LoU) is a concept described in the Concerns-Based Adoption Model (CBAM) by Gene (1975). In line with this study, the LoU dimension describes various behaviours of user in using ubiquitous technology. LoU will represent how ICT undergraduates perceive the use and ease of ubiquitous technology in their daily life either for learning or leisure purposes. There are eight discrete levels that individual may demonstrate, namely, (1) Non-use level; a state which a user has a little or no knowledge of the innovation and no involvement with the innovation. (2) Orientation level; a state in which a user has recently acquired information about the innovation and has recently explored its value orientation and its demands upon user and user system. (3) Preparation level; a state in which the user is preparing for the first use of the innovation and then makes a decision to use the technology by establishing a time to begin and start using the technology. (4) Mechanical use; a state when user focuses most effort on short-term, day-today use of the innovation with little time for reflection. (5) Routine use, a state which user's use of the innovation is stabilized and only a little preparation or thought is being given in improving technology use or its consequences. (6) Refinement use; a state where user varies the use of technology to increase the impact within immediate sphere of influence. (7) Integration level; where user is combining own efforts to use technology with related activities in order to achieve a collective impact within their common sphere of influence. Finally, (8) renewal stage; where user re-evaluates the quality of use of technology, seeks major modifications of or alternatives to present technology as well as explores new developments in using technology.

Therefore, by defining the level of technology use will greatly increase the probability that the phenomenon of technology use can be understood and measured validly and reliably. At the same time, this concept helps researcher to assess ICT undergraduates in higher learning in terms of the perceptions' levels of ubiquitous technology use, and to select appropriate intervention strategies and tactics to facilitate their growth in the use of ubiquitous technology while minimizing the trauma of change.

1.2. Types of Technology Use

The meaning given to technology and the development of technology-practices gives rise to a continuous cycle of innovation through use. Technology will not conform to any particular user but, rather, users acquire technological essence only when their envision or act towards the technology as a means of accomplishing something (Schlosser, 2002). This implies that although technology themselves are continually evolving; it is the actual use that people put in the technology to which will determine if the technology are truly innovative. From this line of thought, there is a need to find out more about how ICT undergraduates use technology, so the both positive and negative outcomes of its use can be determined. Therefore, for this study, the use of technology refers to the purpose of using ubiquitous technology and been categorized into four categories namely; i) technology for inquiry and general use,

ii) technology for communication use, iii) technology for expression use and iv) technology for construction use.

1.3.1 Technology for General Use and Inquiry

According to *Dewan Bahasa dan Pustaka*, Information and Communication Technology encyclopedia (2010), the term general use of technology refers to a common use for certain technology; or a common action that apply by user in using certain technology which not being modified for a particular purpose or function. Meanwhile, according to (Lei, 2010) technology for general use is a technology uses that can be applied or use to any content area and for general purposes. Meanwhile, technology for inquiry is defined as the use of technology for learning purposes especially in the academic world.

1.3.2 Technology for Communication

In ubiquitous learning environment, the use of technology for communication is more compare to face-to-face instruction. The variety of communication options may help students to feel engaged in the learning process through a sense of connectedness, and this is possible with the affordance of ubiquitous technology. The connectedness comes through the immediacy and interpersonal nature of online communication. Face-to-face instruction in a traditional classroom is often public communication, conversely online interaction is more similar to interpersonal communication than other types of communication (Wang, 2009). This interpersonal nature is what gives the potential for informal and personal communication in these learning situations.

1.3.2 Technology for Construction

Technology for construction was defined as using ubiquitous technology for learners to develop new ideas, products and even projects prior to their existing knowledge and achievement in academic context. However, the ideas, products and projects are not being developed for grading purposes. It is for the sake of expressing their personal feeling and fulfilling their leisure time with something good.

At this stage- construction; user puts the elements of usefulness and effectiveness together to form a coherent by reorganizing, constructing and creating new ideas using ubiquitous technology. Users are able to express themselves and produce product(s) of their own (e.g. drawing, music and video) outside the context of formal learning with the affordance of ubiquitous technology, as supported by (Tapscotts, 2010; Lei, 2010).

1.3.4 Technology for Expression

Technologies can also be used as media for learning through expression. The online journaling, for example, engages students' intra personally. Students whose blogging, seem to share the feeling that their communication allows them to develop self-identity and expression (McCullagh, 2008). On top of that, although blogging is somehow categorized and serves as social purposes, it often functions as a tool for sharing personal thoughts and feelings with others too. Particularly interesting for students is the potential of blogging to enhance opportunities to use and express their own voices to speak their stories in a public realm. While this is often done after gathering and later constructing the ideas or original thought together.

2. Research Problem

In Malaysia, the inclination towards mobile technology (including smartphone, laptop and handheld technology) has penetrated to 106 percent compares favourably to Southeast Asia's which is 76 percent. Plus, about 85.1% of Malaysians are using mobile technology and has placed Malaysia in the third position, only behind Singapore and Thailand (MCMC, 2010). More surprisingly, the highest mobile technology usage was recorded among youth between 20 and 24 years old (The Nielsen Mobile Insights Malaysia, 2010) and majority of them were the local undergraduates. Therefore, this has shown a good sign for the successful of the implementation of ubiquitous learning environment in Malaysian's higher learning as the technologies are already within the students' vicinity.

Next, the discussions in the field of technology in education concern a host of issue, including a pedagogical theory, methods of use and effectiveness. However, in many cases these debates leave unexamined some fundamental issue about how and why *these* technologies are being used.

According to Zhao (2007), technology was often examined at a very general level and treat technology as an undifferentiated characteristic of schools and higher institutions. Technologies may have different impacts on students' outcomes, even the same technology can be used differently in various contexts to solve all kinds of problems and thus have different meanings in different settings. Finally, most studies focus on the impact of the quantity of technology use, in other words, *how much* or how frequently technologies are used, but ignore the quality of technology use, that is, *how* technology is used.

Therefore, this study sought to determine the levels of technology use based on LoU concepts and at the same time the level of use of ubiquitous technology which based on the five categories. These categories based on the natural impulse of a child proposed by John Dewey (Dewey, 1943): inquiry, communication, construction and expression and also adapted from Levin & Bruce (2001) for general use.

3. Research Objectives

The objectives of this study were to determine:

i. The types of ubiquitous technology use among ICT undergraduates.
ii. The levels of ubiquitous technology use among ICT undergraduates.

4. Methodologies & Instruments

A survey was carried out on total sample of 250 ICT undergraduates at one of Malaysian Technical universities. However, only 80 sets of questionnaires were being fully completed by the respondents. Respondents answered on a five-point Likert type scale (1=strongly disagree, 2=disagree, 3=neutral, 4= agree, 5=strongly agree). The questionnaire was divided into two parts. The first part collected the student's demographic information such as gender, race, and technology ownership. The second part of the questionnaire was divided into another three sections. (Section A: Attitude, Belief and Interest in Ubiquitous Technology, Section B: Levels of use of Technology and Section C: Types of use of Technology). However, in this paper the researcher will discuss on the analysis done on Section B and C only; which are the levels and types of technology use of ubiquitous technology.

5. Data analysis

5.1 Reliability Test

For this study, the reliability of the items in the instrument was conducted as it increased the likelihood of success and also developed and test adequacy of research instruments (Edwin, 2001). The reliability test was conducted to 35 of 1st year ICT undergraduates in order to find the consistency of scores or answers provided by an instrument before embark to the real study. From the analysis, the instruments' reliability was r= 0.819 for levels of use and r= 0.901 for types of use. Therefore, the overall reliability of the instrument was satisfactory.

5.2 Demographic Profiles of the Students

The demographic profiles of the sampled students were based on 3 variables, which included gender, program/faculty and ownership of ubiquitous technology. In this research, 46 (57.5%) were male and 34 (42.5%) were female of the 3rd year undergraduates from Information & Communication Technology faculty. The selection of the targeted sample was done according to the list of students' matrix number obtained from the administration of the respective university.

On the technology ownership result, almost of the respondents own a laptop and more than half own a smartphone. Meanwhile, Tablet PCs was not a favourite technology among respondents as only few of them own it where only 9 out of 80 own a Tablet PCs. However, this did not mean that they were not exposing to the use of latest technology, as the respondents might had another technology that complement their learning in the university.

Item	**Frequency /Percentage**	
A. Gender		
Male	N= 46	(57.5%)
Female	N= 34	(42.5%)
B. Program		
Information Technology	N= 80	(100%)
C. Technology Ownership		
Smartphone	N= 51	(63.8%)
Laptop/netbook	N = 70	(87.5%)
Tablet PCs	N = 9	(11.3%)

Fig. 1. Demographic profile

5.3 Types of Technology Use

According to table 1, there were four types of use that obtained mean of 4.00 and above, namely; technology use for completing assignment (mean = 4.44, SD= .691) and downloading notes (mean = 4.29, SD= .834), which felt under the inquiry category. Meanwhile, online chatting; which felt under communication category (mean = 4.18, SD= .808) and as a medium to save file; general category (mean =

4.04, SD= .787). Result also showed that, students shared ideas and willing to express their thoughts by posted online comments and use ubiquitous technology for capturing and recording, both were at (mean= 3.90, SD= .922 and .821).

Students also used ubiquitous technology for analyzing data, such as; using a spreadsheet, building graph and also collaborating with certain software in certain courses while in the university. Then, the usage of ubiquitous technology was not limited to inquiry purposes only, but been used for entertainment and expression too, such as for playing online games (mean= 3.73, SD= .871). Finally, from the table, result showed that the least types of technology use was for construction purposes; like constructing music (mean = 3.45, SD= .884) and creating new innovation (mean= 3.14, SD= .781). This had shown that, the usage of ubiquitous technology for higher thinking order was still at moderate level among ICT undergraduates and perhaps was limited due to their competency in using the ubiquitous technology.

Purposes	***Mean/ SD***	***Category of Technology Use***
Complete assignment	4.44 / .691	Inquiry
Download lecture notes	4.29 / .834	Inquiry
Online chatting	4.18 / .808	Communication
Medium to save files	4.04 / .787	General
Post comment online	3.90 / .922	Expression
Capture and record picture	3.90 / .821	General
Reading online books/newspaper	3.86 / .848	Inquiry
Watch live broadcast	3.84 / .863	General
Find location of friends and family	3.83 / .903	Communication
Analyze data	3.81 / .797	Inquiry
Play online games	3.73 / .871	Expression
Personal diary	3.49 / 1.029	General
Construct music	3.45 / .884	Construction
Express feeling in blog	3.41 / .951	Expression
Online shopping	3.19 / 1.057	Construction
Create new innovation	3.14 / .781	Construction

Fig. 1. The Technology Use

4.4 Levels of Ubiquitous Technology Use

According to table 2 below, majority of the students (n=30, 37.5%; female-18 and male-12) were at level routine. At this level, in term of knowledge-wise, students knew both short and long term requirements for use and how to use them with minimum effort or stress. Therefore, most of them used ubiquitous technology smoothly with minimal management problem. Meanwhile, in term of pattern use, there still a little variation applied to the use of ubiquitous technology. The second largest group was at orientation level (n= 20, 25%; female-4 and male-16). At this level, students discerned general information about ubiquitous technology they owned such as its origin, characteristics and requirements. However, they were still exploring the ubiquitous technology and their requirements by talking, reviewing, gathering information and observing others using it. Lastly, the least number of respondents (n= 1, 1.25%; male-1) felt under the highest level of use; a renewal level where student was able to explore others technology that could be used in combination with or in place of the present technology

he/she owned, in an attempt to develop more effective means of achieving good outcomes, especially in learning.

Therefore, in this study, finding indicated that the level of technology use of ICT undergraduates was at routine level, although there was only a little preparation or thought being given in improving ubiquitous technology use and its consequences, the use of ubiquitous technology among them was still at stabilized level and satisfactory; (mean = 2.74, SD = 0.484).

Level of Technology Use	**Frequency & Percentage**
Non-use	Female (n= 1) Male (n= 2)
Orientation	Female (n= 4) Male (n= 16)
Preparation	Female (n= 1) Male (n= 4)
Mechanical Use	Female (n= 4) Male (n= 6)
*Routine	Female (n= 18)* Male (n= 12)*
Refinement	Female (n= 2) Male (n= 4)
Integration	Female (n= 3) Male (n= 2)
Renewal	Male (n= 1)
Total	**80**

Fig. 2. The Levels of Technology Use

4. Conclusion and Recommendation

The study found that the type of technology use attempted by majority of ICT undergraduates was for inquiry purposes and perceived the ubiquitous technology as a useful technology that might help them to attain gains in their job performance especially for learning purposes. Meanwhile for the level of use, majority of them were at the routine level, where they used the ubiquitous technology smoothly with minimal management problem.

However, a in depth research is required, in order to investigate on the factors that influence the levels of use of ubiquitous technology among ICT undergraduates and find out what are others significant

moderators that discriminate the levels in using technology. More efforts are needed to determine the students' actual use of ubiquitous technology and propose a framework that relatively portrayed ICT or perhaps undergraduates from all fields.

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